

CLAIMS:

What is claimed is:

5 1. A composition comprising an enzyme exhibiting laccase activity and an enzyme enhancing agent selected from 2-thiouracil, sodium dimethyldithio carbonate hydrate, N-benzylidene-benzylamine, melamine, anthracene, dicyandiamide, sulfanilic acid, sulfanilamide, urea, salicylic acid, 3,4,5-trihydroxy-benzoic acid, ferric chloride, potassium ferricyanide, ascorbic acid, Zincon (o-[2-[alpha(2-hydroxy-5-sulfophenylazo)benzylidene]hydrazino]benzoic acid), diisopropanolamine, adenosine triphosphate, guanidine, cyanuric acid, Thiazol Yellow G, nicotinic acid, Metanil Yellow, hardwood black liquor, softwood black liquor, methanesulfonic acid, metanilic acid, sulfamide, 3-pyridine sulfonic acid, benzofuroxan, t-butyl hydroperoxide, pyruvic acid, imidazole, N-acetylcytosine, and phenol.

2. The composition of claim 1 wherein said enzyme exhibiting laccase activity is selected from a laccase enzyme of enzyme classification EC 1.10.3.2, a catechol oxidase enzyme of enzyme classification EC 1.10.3.1, a monophenol monooxygenase enzyme of enzyme classification EC 1.14.99.1, a bilirubin oxidase enzyme of enzyme classification EC 1.3.3.5, and an ascorbate oxidase enzyme of enzyme classification EC 1.10.3.3.

3. The composition of claim 1 that further comprises a hydrolase.

4. The composition of claim 3 wherein said hydrolase is a xylanase.

5. A process for oxidizing a substrate, comprising treating the substrate with a composition comprising an enzyme exhibiting laccase activity and an enzyme enhancing agent selected from 2-thiouracil, sodium dimethyldithio carbonate hydrate, N-benzylidene-benzylamine, melamine, anthracene, dicyandiamide, sulfanilic acid, sulfanilamide, urea, salicylic

acid, 3,4,5-trihydroxy-benzoic acid, ferric chloride, potassium ferricyanide, ascorbic acid, Zincon (o-[2-[alpha(2-hydroxy-5-sulfophenylazo)benzylidene]hydrazino]benzoic acid), diisopropanolamine, adenosine triphosphate, guanidine, cyanuric acid, Thiazol Yellow G, nicotinic acid, Metanil Yellow, hardwood black liquor, softwood black liquor, methanesulfonic acid, metanilic acid, sulfamide, 3-pyridine sulfonic acid, benzofuroxan, t-butyl hydroperoxide, pyruvic acid, imidazole, N-acetylcytosine, and phenol.

6. The process of claim 5 wherein said enzyme exhibiting laccase activity is selected from a laccase enzyme of enzyme classification EC 1.10.3.2, a catechol oxidase enzyme of enzyme classification EC 1.10.3.1, a monophenol monooxygenase enzyme of enzyme classification EC 1.14.99.1, a bilirubin oxidase enzyme of enzyme classification EC 1.3.3.5, and an ascorbate oxidase enzyme of enzyme classification EC 1.10.3.3.

7. The process of claim 5 wherein said treating further includes a hydrolase.

8. The process of claim 7 wherein said hydrolase is a xylanase.

9. The process of claim 5 that further comprises adding an oxidizing agent.

10. The process of claim 9 wherein said oxidizing agent is at least one of air, oxygen, and hydrogen peroxide.

11. A process for bleaching a lignin-containing material, comprising treating the material with an enzyme exhibiting laccase activity and an enzyme enhancing agent selected from 2-thiouracil, sodium dimethyldithio carbonate hydrate, N-benzylidene-benzylamine, melamine, anthracene, dicyandiamide, sulfanilic acid, sulfanilamide, urea, salicylic acid, 3,4,5-trihydroxy-benzoic acid, ferric chloride, potassium ferricyanide, ascorbic acid, Zincon (o-[2-[alpha(2-hydroxy-5-sulfophenylazo)benzylidene]hydrazino]benzoic acid), diisopropanolamine, adenosine triphosphate, guanidine, cyanuric acid, Thiazol Yellow G, nicotinic acid, Metanil Yellow,

hardwood black liquor, softwood black liquor, methanesulfonic acid, metanilic acid, sulfamide, 3-pyridine sulfonic acid, benzofuroxan, t-butyl hydroperoxide, pyruvic acid, imidazole, N-acetylcytosine, and phenol.

- 5 12. The process of claim 11 wherein said enzyme exhibiting laccase activity is selected from a laccase enzyme of enzyme classification EC 1.10.3.2, a catechol oxidase enzyme of enzyme classification EC 1.10.3.1, a monophenol monooxygenase enzyme of enzyme classification EC 1.14.99.1, a bilirubin oxidase enzyme of enzyme classification EC 1.3.3.5, and an ascorbate oxidase enzyme of enzyme classification EC 1.10.3.3.

10

13. The process of claim 11 wherein said treating further includes a hydrolase.

14. The process of claim 13 wherein said hydrolase is a xylanase.

15. The process of claim 11 that further comprises adding an oxidizing agent.

16. The process of claim 15 wherein said oxidizing agent is at least one of air, oxygen, and hydrogen peroxide.

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17. The process of claim 11 wherein said material is a wood pulp.

18. The process of claim 17 wherein said wood pulp is a raw material used to form a polysaccharide or a cellulose derivative.

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19. A process for enhancing the activity of an enzyme exhibiting laccase activity, comprising adding an enzyme enhancing agent to said enzyme, wherein said enzyme enhancing agent is selected from 2-thiouracil, sodium dimethyldithio carbonate hydrate, N-benzylidene-benzylamine, melamine, anthracene, dicyandiamide, sulfanilic acid, sulfanilamide, urea, salicylic acid, 3,4,5-trihydroxy-benzoic acid, ferric chloride, potassium ferricyanide, ascorbic acid,

Zincon (o-[2-[alpha(2-hydroxy-5-sulfophenylazo)benzylidene]hydrazino]benzoic acid),
diisopropanolamine, adenosine triphosphate, guanidine, cyanuric acid, Thiazol Yellow G,
nicotinic acid, Metanil Yellow, hardwood black liquor, softwood black liquor, methanesulfonic
acid, metanilic acid, sulfamide, 3-pyridine sulfonic acid, benzofuroxan, t-butyl hydroperoxide,
5 pyruvic acid, imidazole, N-acetylcytosine, and phenol.

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